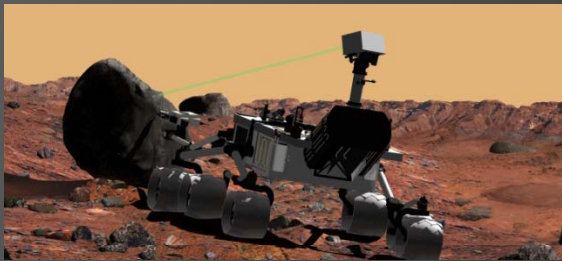
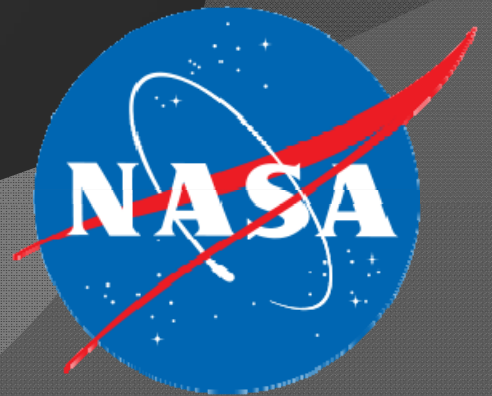


NASA IV&V Workshop 2012

A DATA OBJECT MODEL FOR IV&V ANALYSIS

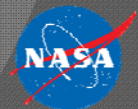


The MSL Experience



Developing a Data Object Model

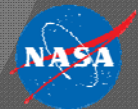
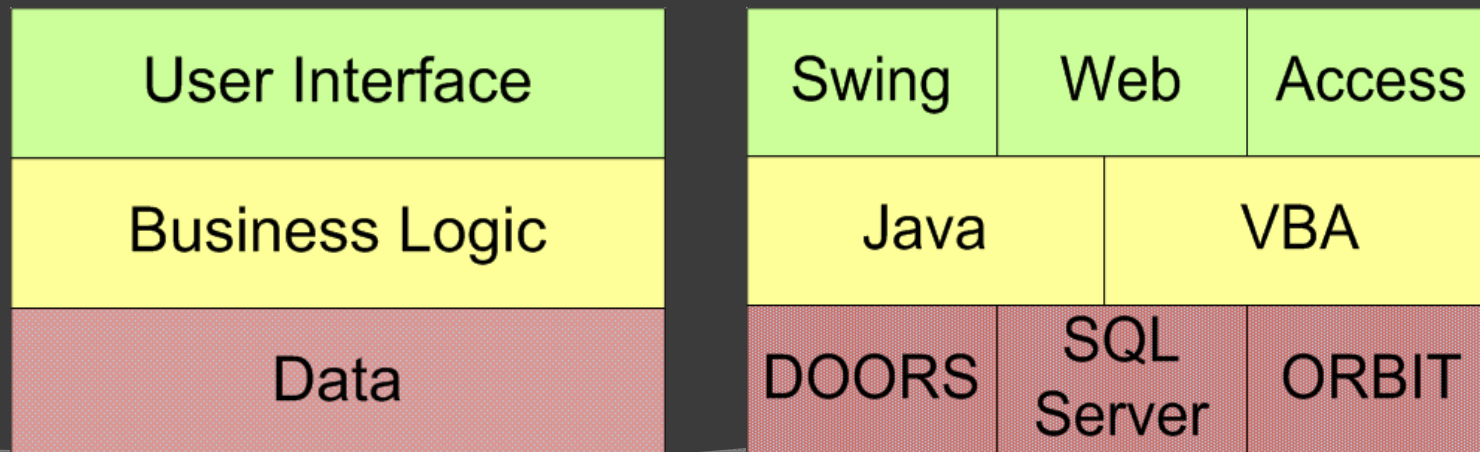
- Data Object Model – An implementation of the Data and Information Viewpoint (DIV) in DoDAF
- In support of the integrated analysis techniques being developed for the Mars Science Laboratory (MSL) IV&V project
- What we did on MSL
- What we could have done better
- Where we can take it



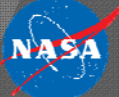
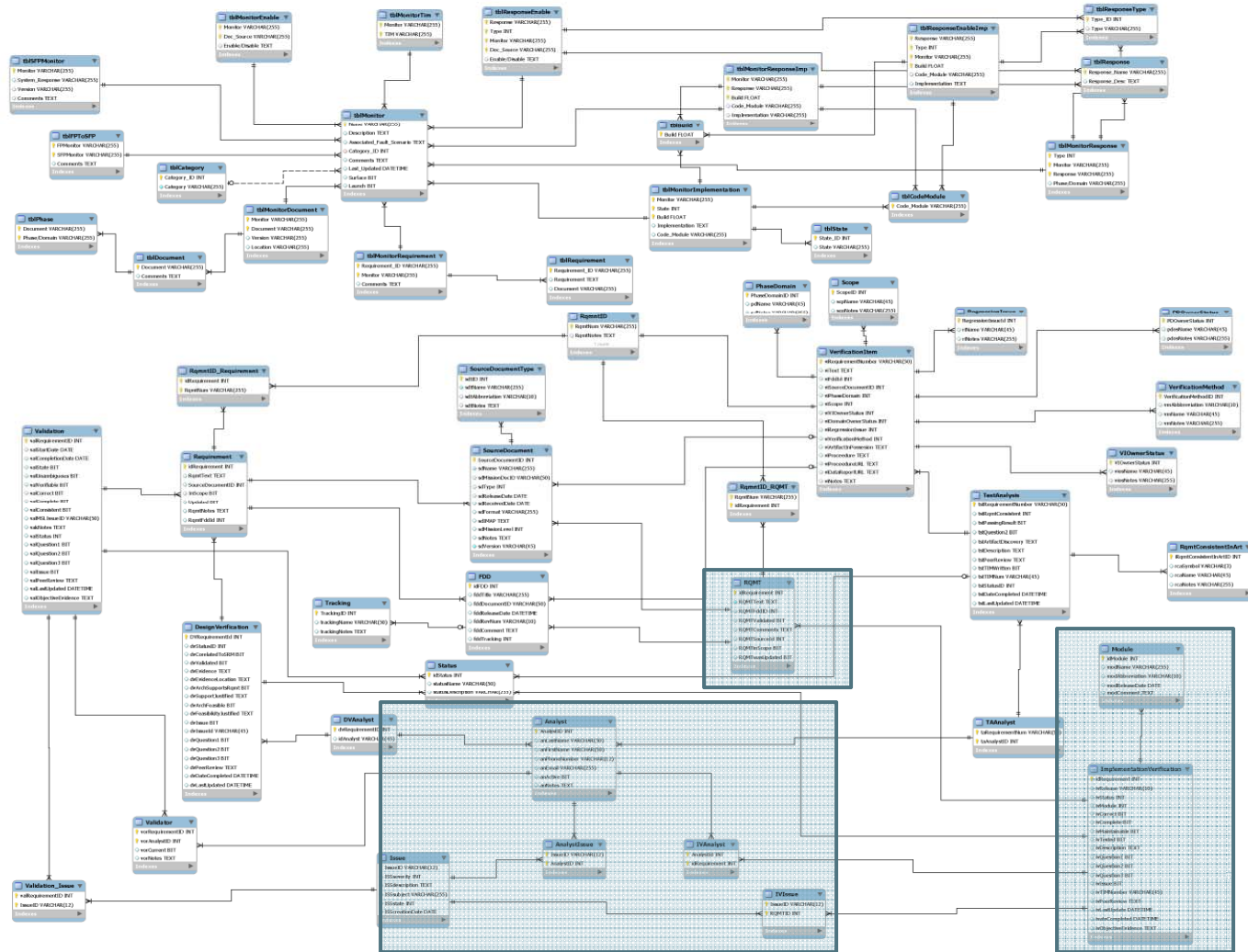
Independent Verification
and Validation Facility

The Development Architecture

- Capture essential information from the integrated analysis
- Maintain data in a central repository
- Support multiple user interfaces (N-tier Development)

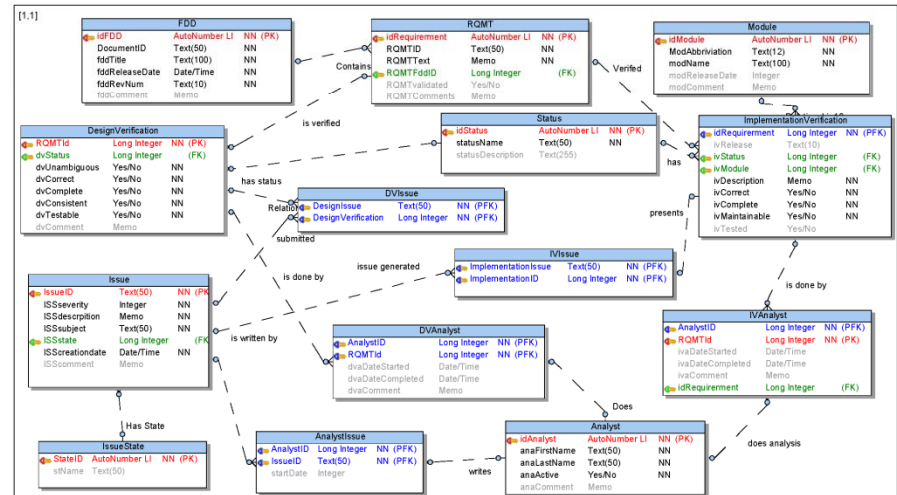


The Data Layer (SQL Server)



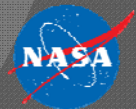
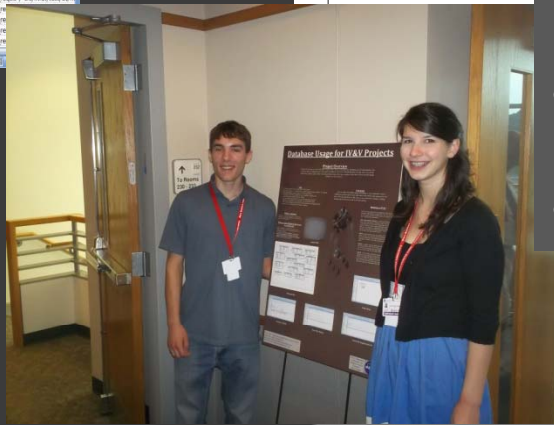
Independent Verification and Validation Facility

Capture the essential information

[illegible]

What “Hidden” data, such as status of the analysis, is not on the spreadsheet?

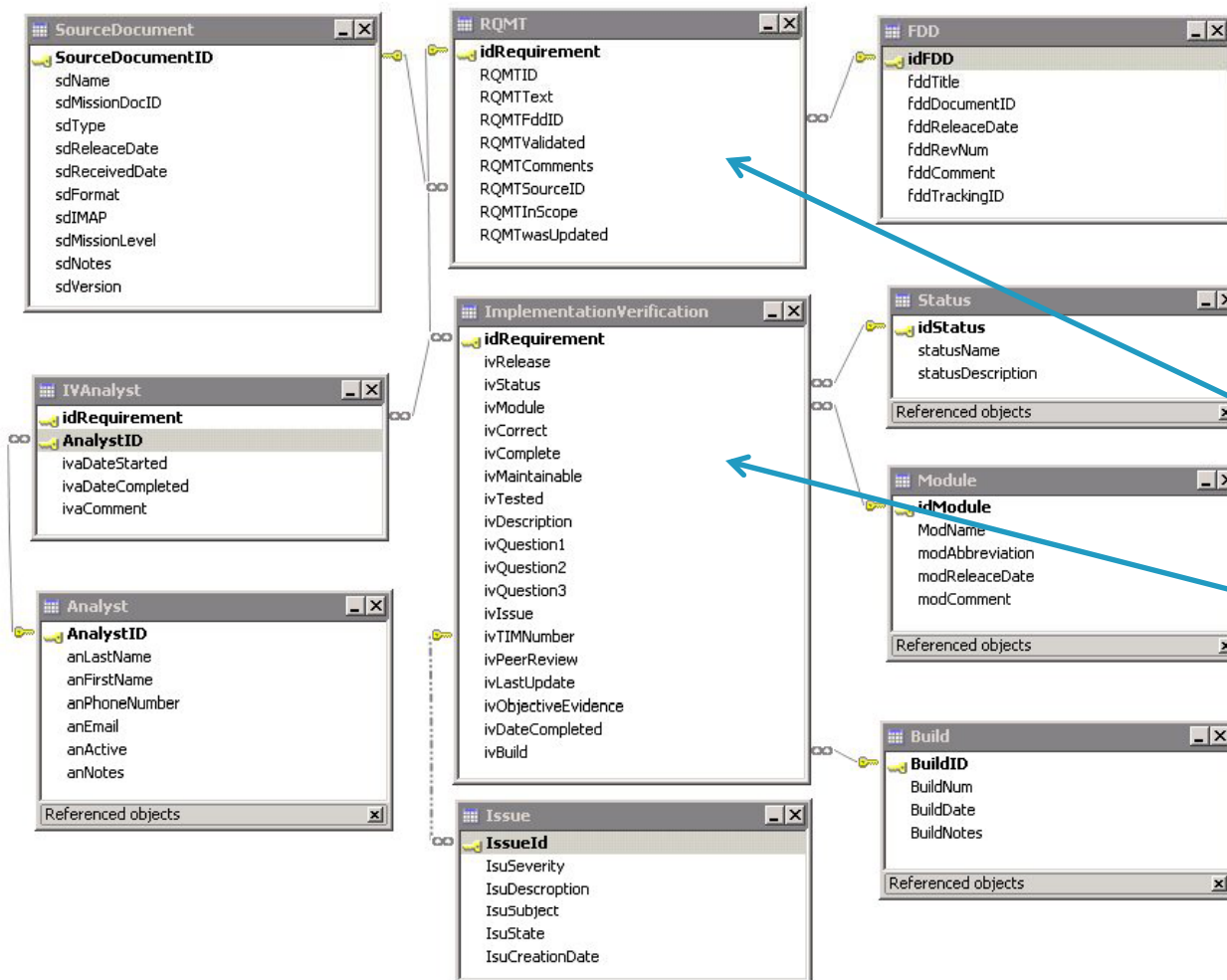
- “It depends on the business rules”
- Rules may affect any or all of the layers.
- Which rules define data?



Independent Verification and Validation Facility

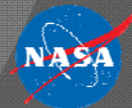
The SemanticAnalysis Object

The Data Layer



The object contains information about:

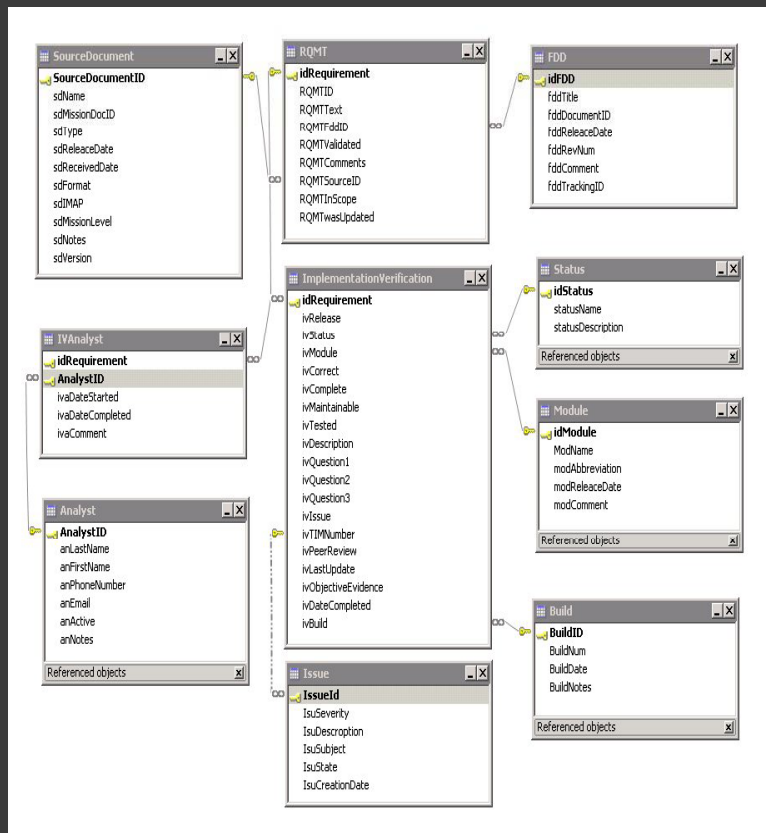
- The requirement being analyzed
- The analysis activity



Independent Verification
and Validation Facility

The SemanticAnalysis Object

The Business Logic Layer



spGetSA

A set of stored procedures was written to facilitate object construction

SemanticAnalysis

```
-idRequirement : int
-RqmtNum : string
-RqmtText : string
-FddId : int
-FddTitle : string
-SourceID : int
-InScope : bool
-WasUpdated : bool
-AnalystId : int
-AnalystFirst : string
-AnalystLast : string
-ivStatus : int
-statusName : string
-ivModule : int
-modName : string
-ivRelease : string
-buildNum : string
-ivBuild : int
-ivCorrect : bool
-ivComplete : bool
-ivMaintainable : bool
-ivTested : bool
-ivQuestion2 : bool
-ObjectiveEvidence : string
-AnalystFindings : string
-PeerReview : string
-ivIssue : bool
-ivTIMNNumber : string
-lastUpdated : Date
+isEmpty() : bool
+cancelChanges()
+getSqlUpdate() : string
+initializeChanged()
+setChanges()
+boolToInt(in b : bool) : int
+getSqlDate() : string
```

A lesson learned:

- The object is one of several analysis objects
- An abstract Analysis class should have been designed
- The class should have been decomposed and common items such as Analyst or FDD should be independent classes



Independent Verification
and Validation Facility

The SemanticAnalysis Object

The User Interface Layer

MSL Analysis Tracking Tool

SemanticAnalysis

```
-idRequirement : int
-RqmtNum : string
-RqmtText : string
-FddId : int
-FddTitle : string
-SourceID : int
-InScope : bool
-WasUpdated : bool
-AnalystId : int
-AnalystFirst : string
-AnalystLast : string
-ivStatus : int
-statusName : string
-ivModule : int
-modName : string
-ivRelease : string
-buildNum : string
-ivBuild : int
-ivCorrect : bool
-ivComplete : bool
-ivMaintainable : bool
-ivTested : bool
-ivQuestion2 : bool
-ObjectiveEvidence : string
-AnalystFindings : string
-PeerReview : string
-ivIssue : bool
-ivTIMNNumber : string
-lastUpdated : Date
+isEmpty() : bool
+cancelChanges()
+getSqlUpdate() : string
+initializeChanged()
+setChanges()
+boolToInt(in b : bool) : int
+getSqlDate() : string
```

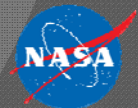
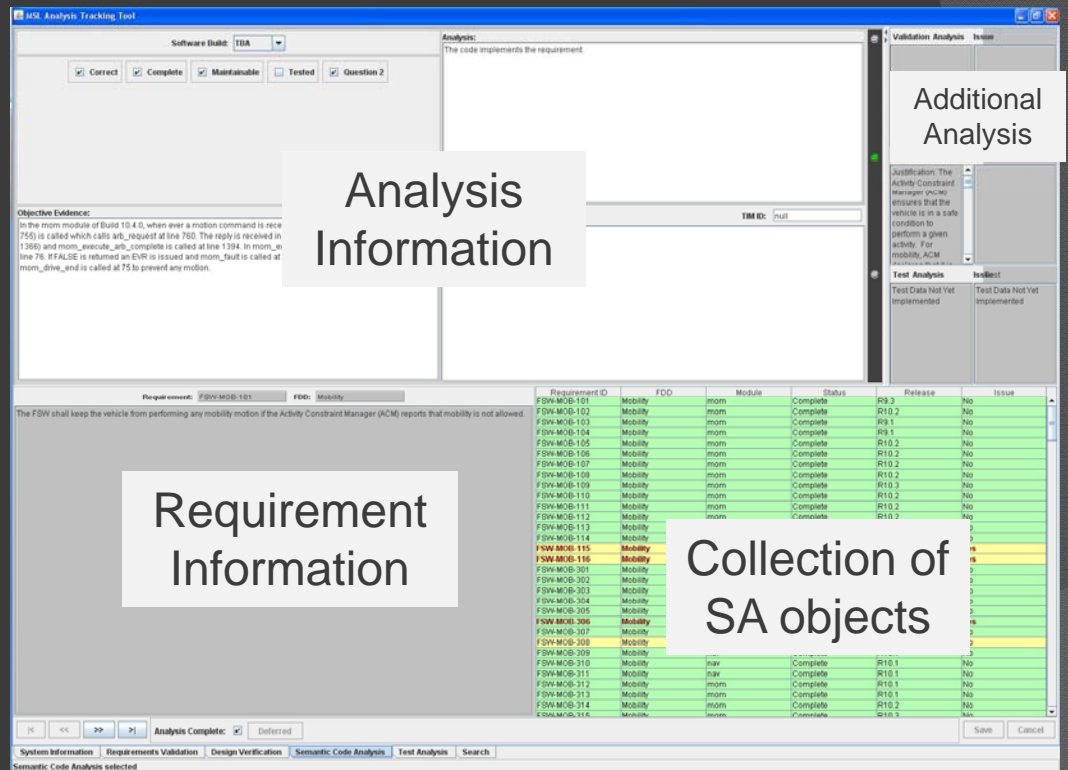
The class has been implemented in both Java, for a client for analysts, and Visual Basic for Applications, for an Access application to manage the database

Analysis Information

Additional Analysis

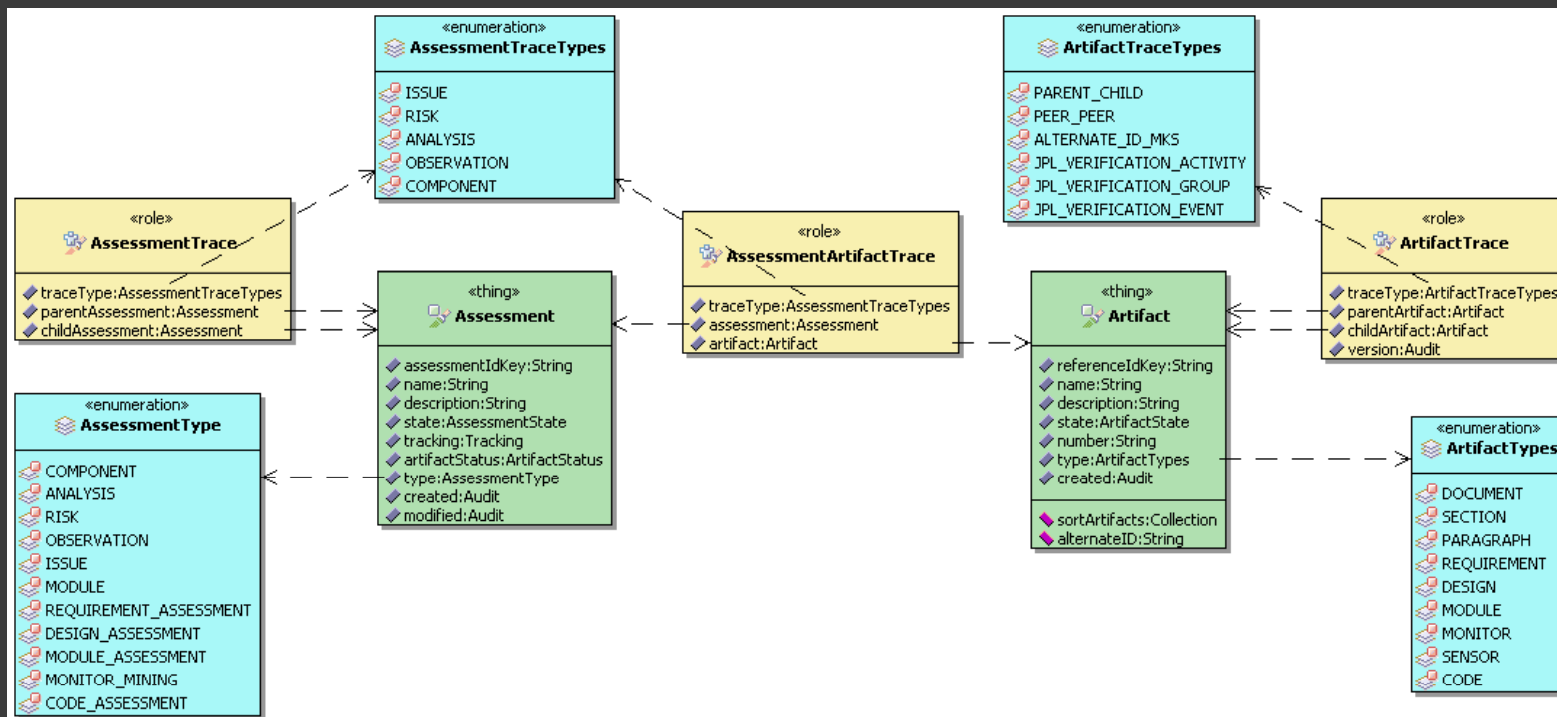
Requirement Information

Collection of SA objects

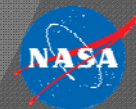


Independent Verification
and Validation Facility

What an IV&V Domain Model Might Look Like



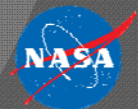
Used by the SMAP team



Independent Verification
and Validation Facility

Benefits of a Domain Model

- Supports a common definition of the IV&V analysis data architecture.
- Provides building blocks for evidence based IV&V analysis.
- Encourages creation and reuse of analysis support utilities across technologies
- Leverages current IV&V technology investments



Resources

- DoD Architecture Framework Ver. 2.02
Data and Information Viewpoint
(http://dodcio.defense.gov/dodaf20/dodaf20_data.aspx)
- NASA, Office of the Chief Information
Officer: Enterprise Portfolio Management
(<http://www.nasa.gov/offices/ocio/portfolio/index.html>)
- The Java Tutorials: Object-Oriented
Programming Concepts
(<http://docs.oracle.com/javase/tutorial/java/concepts/>)
- U.S Department of Defense, Chief
Information Officer: Data Strategy
Community of Interest
(<http://dodcio.defense.gov/CommunitiesofInterest/DataStrategyCOITraining.aspx>)

